RADIO TEST REPORT

Test Report No. 15921131H-A-R2

Customer	**ALPS ALPINE CO., LTD.**
Description of EUT	**Obstacle Avoidance Radar**
Model Number of EUT	**A2401**
FCC ID	**CWTA2401**
Test Regulation	**FCC Part 95 Subpart M**
Test Result	**Complied**
Issue Date	**September 16, 2025**
Remarks	**-**

Representative test engineer	Approved by
Junki Nagatomi Engineer	Ryota Yamanaka Engineer

CERTIFICATE 5107.02

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.
☒ There is no testing item of "Non-accreditation".

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- For any test report referred in this report, the latest version (including any revisions) is always referred to.
- If the latest version is a revision, it replaces the previous version. See the table below for revisions and versions.

REVISION HISTORY

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15921131H-A	September 1, 2025	-
	15921131H-A-R1	September 9, 2025	Correction of erroneous description in test voltage of Clause 4.2; DC 12 V → DC 14.08 V
1	15921131H-A-R1	September 9, 2025	Changed to "99 % OBW" from "-20 dB Bandwidth" in SECTION 6.
1	15921131H-A-R1	September 9, 2025	Replacing the Tx 2 data for Occupied bandwidth test; 1.7349 GHz → 1.7301 GHz
1	15921131H-A-R1	September 9, 2025	- Correction of Fs frequency and FMCW Desensitization factor (p.16) - Reflection of the above value in Radiated Power data (p.19)
1	15921131H-A-R1	September 9, 2025	Correction of the Duty factor; 15.03 → 15.04 (p.19, 21)
1	15921131H-A-R1	September 9, 2025	Correction of 1 burst (Tx 3) in the test table for Modulation characteristics test; 3.069 → 3.064 (p.21)
1	15921131H-A-R1	September 9, 2025	Correction of the waveform data title for Modulation characteristics test (p.21 to 23)
1	15921131H-A-R1	September 9, 2025	Addition and updated of the following information due to the additional testing of “Field strength of spurious radiation” (231 GHz to 243 GHz); Clause 2.1: Test date SECTION 5: Measurement range APPENDIX 1: Test data and test date APPENDIX 2: Test instruments
1	15921131H-A-R1	September 9, 2025	Replacing the test data and correction of the voltage notation for Frequency stability test.
1	15921131H-A-R1	September 9, 2025	Correction of the following erroneous description; “Leader” → “Engineer” (p.1) "detctor" → "detector" (p.14) "caluculation" → "calculation" (p.15) "converion loss" → "conversion loss" (p.26)
2	15921131H-A-R2	September 16, 2025	Correction to the Operating Mode(s) table in Clause 4.1.
2	15921131H-A-R2	September 16, 2025	Addition of the Test Distance (231 GHz to 243 GHz) in SECTION 5 (p.15)
2	15921131H-A-R2	September 16, 2025	Correction of the Tx on time in Modulation characteristics test data; Tx1: 2.50 → 2.51, Tx2: 2.50 → 2.52, Tx3: 2.51 → 2.52
2	15921131H-A-R2	September 16, 2025	Correction of the Duty factor in Radiated Power and Modulation characteristics tests; Tx1:15.05 → 15.04, Tx2:15.05 → 15.02, Tx3:15.04 → 15.02 (p.20, 22)
2	15921131H-A-R2	September 16, 2025	Correction of test mode name for Tx1, Tx2, Tx3 in Modulation characteristics test. (p.22 to 24)
2	15921131H-A-R2	September 16, 2025	Addition of duty for normal operation mode (Reference data) in Modulation characteristics test. (p.25)

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	ICES	Interference-Causing Equipment Standard
AC	Alternating Current	IEC	International Electrotechnical Commission
AFH	Adaptive Frequency Hopping	IEEE	Institute of Electrical and Electronics Engineers
AM	Amplitude Modulation	IF	Intermediate Frequency
Amp, AMP	Amplifier	ILAC	International Laboratory Accreditation Conference
ANSI	American National Standards Institute	ISED	Innovation, Science and Economic Development Canada
Ant, ANT	Antenna	ISO	International Organization for Standardization
AP	Access Point	JAB	Japan Accreditation Board
ASK	Amplitude Shift Keying	LAN	Local Area Network
Atten., ATT	Attenuator	LIMS	Laboratory Information Management System
AV	Average	MCS	Modulation and Coding Scheme
BPSK	Binary Phase-Shift Keying	MRA	Mutual Recognition Arrangement
BR	Bluetooth Basic Rate	N/A	Not Applicable
BT	Bluetooth	NIST	National Institute of Standards and Technology
BT LE	Bluetooth Low Energy	NS	No signal detect.
BW	BandWidth	NSA	Normalized Site Attenuation
Cal Int	Calibration Interval	NVLAP	National Voluntary Laboratory Accreditation Program
CCK	Complementary Code Keying	OBW	Occupied Band Width
Ch., CH	Channel	OFDM	Orthogonal Frequency Division Multiplexing
CISPR	Comite International Special des Perturbations Radioelectriques	P/M	Power meter
CW	Continuous Wave	PCB	Printed Circuit Board
DBPSK	Differential BPSK	PER	Packet Error Rate
DC	Direct Current	PHY	Physical Layer
D-factor	Distance factor	PK	Peak
DFS	Dynamic Frequency Selection	PN	Pseudo random Noise
DQPSK	Differential QPSK	PRBS	Pseudo-Random Bit Sequence
DSSS	Direct Sequence Spread Spectrum	PSD	Power Spectral Density
EDR	Enhanced Data Rate	QAM	Quadrature Amplitude Modulation
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QP	Quasi-Peak
EMC	ElectroMagnetic Compatibility	QPSK	Quadri-Phase Shift Keying
EMI	ElectroMagnetic Interference	RBW	Resolution Band Width
EN	European Norm	RDS	Radio Data System
ERP, e.r.p.	Effective Radiated Power	RE	Radio Equipment
EU	European Union	RF	Radio Frequency
EUT	Equipment Under Test	RMS	Root Mean Square
Fac.	Factor	RSS	Radio Standards Specifications
FCC	Federal Communications Commission	Rx	Receiving
FHSS	Frequency Hopping Spread Spectrum	SA, S/A	Spectrum Analyzer
FM	Frequency Modulation	SG	Signal Generator
Freq.	Frequency	SVSWR	Site-Voltage Standing Wave Ratio
FSK	Frequency Shift Keying	TR	Test Receiver
GFSK	Gaussian Frequency-Shift Keying	Tx	Transmitting
GNSS	Global Navigation Satellite System	VBW	Video BandWidth
GPS	Global Positioning System	Vert.	Vertical
Hori.	Horizontal	WLAN	Wireless LAN

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SECTION 1: Customer Information

Company Name	ALPS ALPINE CO., LTD.
Address	6-3-36 Furukawanakazato Osaki-city Miyagi-pref 989-6181 Japan
Telephone Number	+81-229-23-5111
Contact Person	Yuji Ouchi

The information provided by the customer is as follows;
- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Obstacle Avoidance Radar
Model Number	A2401
Serial Number	Refer to SECTION 4.2
Condition	Pre-production (Not for Sale: This sample is equivalent to production version.)
Modification	No Modification by the test lab
Receipt Date	July 30, 2025
Test Date	July 31 to September 5, 2025

2.2 Product Description

General Specification

Rating	DC 12.8 V
Operating temperature	-30 deg. C to +80 deg. C

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	77.1 GHz to 78.9 GHz
Bandwidth	1.8 GHz
Type of Modulation	Frequency modulation (FMCW)
Antenna Gain	10 dBi
Usage location	Ground Vehicle mounted

SECTION 3: Test Summary

3.1 Test Specification

Test Specification	FCC Part 95 Subpart M The latest version on the first day of the testing period
Title	FCC 47CFR Part95 – PERSONAL RADIO SERVICES Subpart M – The 76-81 GHz Band Radar Service

3.2 Reference Standards

ANSI C63.26-2015
KDB 971168 D01 v03r01
KDB 653005 D01 v01r02 for FCC

3.3 Summary of Test Results

Item	Specification	Results	Remarks
Conducted emission	**FCC:** N/A	N/A	*1)
Occupied bandwidth	**FCC:** Section 2.1049	Complied	Radiated
Radiated Power / Modulation characteristics	**FCC:** Section 95.3367 Section 2.1046 Section 2.1047	Complied	Radiated
Field strength of spurious radiation	**FCC:** Section 95.3379 (a) Section 2.1053 Section 2.1057	Complied	Radiated
Frequency stability	**FCC:** Section 95.3379 (b) Section 2.1055	Complied	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

Supplied Voltage Information
The EUT provides stable voltage constantly to RF Part regardless of input voltage.

Antenna Information
The antenna is not removable from the EUT.

3.4 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.5 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.
Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k* = 2.

Radiated emission

Measurement distance	Frequency range		Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz		dB	3.3
10 m			dB	3.1
3 m	30 MHz to 200 MHz	Horizontal	dB	5.0
		Vertical	dB	5.0
	200 MHz to 1000 MHz	Horizontal	dB	5.2
		Vertical	dB	6.2
10 m	30 MHz to 200 MHz	Horizontal	dB	5.5
		Vertical	dB	5.4
	200 MHz to 1000 MHz	Horizontal	dB	5.5
		Vertical	dB	5.5
3 m	1 GHz to 6 GHz		dB	5.1
	6 GHz to 18 GHz		dB	5.4
1 m	10 GHz to 18 GHz		dB	5.4
	18 GHz to 26.5 GHz		dB	5.3
	26.5 GHz to 40 GHz		dB	4.8
0.5 m	26.5 GHz to 40 GHz		dB	5.0
>= 0.5 m	40 GHz to 50 GHz		dB	4.3
	50 GHz to 75 GHz		dB	5.9
	75 GHz to 110 GHz		dB	5.7
>= 3.8 cm	110 GHz to 170 GHz		dB	5.8*
>= 2.5 cm	170 GHz to 260 GHz		dB	5.2*

*under consideration about Uncertainty for testing at 1 cm distance

Radiated emission (with Block downconverter)

Measurement distance	Frequency range	Uncertainty (+/-)
>= 0.5 m	75 GHz to 83 GHz	3.4 dB*

* This value was used for 75 GHz - 83 GHz in this report.

3.6 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999
A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber (SAC1)	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber (SAC2)	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber (SAC3)	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room (PR3)	3 m
No.3 shielded room (SR3)	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber (SAC4)	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room (PR4)	3 m
No.4 shielded room (SR4)	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber (SAC5)	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room (MR5)	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room (SR6)	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room (MR6)	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room (SR7)	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room (MR8)	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room (MR9)	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room (SR10)	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room (MR11)	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room (MR12)	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

3.7 Test data, Test instruments, and Test set up

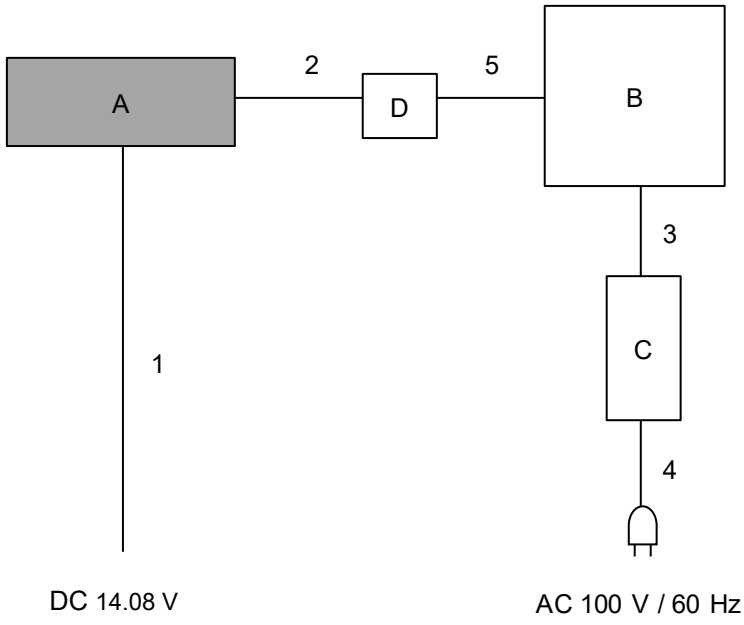
Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Test Item
Test mode (Tx1, Tx2, Tx3)	Occupied bandwidth, Radiated Power *2), Modulation characteristics *1)
Normal operating mode (Tx)	Modulation characteristics (Reference data) *1), Field strength of spurious radiation, Frequency stability
*Power of the EUT was set by the software as follows; Power Setting: 19.22 dBm (EIRP) Software: 5AB-01978A10 (Date: 2025.07.30, Storage location: EUT memory)	
This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. *1) The duty setting differs between Test mode and Normal operating mode. *2) In the test mode duty, the timed average is lower than in the normal operating mode, so the worst duty is taken into consideration and corrected to the burst average.	

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Obstacle Avoidance Radar	A2401	2507280001	ALPS ALPINE CO., LTD.	EUT
B	Laptop PC	1601	17830240853	Microsoft Japan Co.Ltd	-
C	AC Adapter	1536	ODI30T07PGF4I	Microsoft Japan Co.Ltd	-
D	CAN Interface	VN1610	007150-526794	VECTOR	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	5.5	Unshielded	Unshielded	-
2	CAN Cable	3.0	Unshielded	Unshielded	-
3	DC Cable	1.5	Unshielded	Unshielded	-
4	AC Cable	1.8	Unshielded	Unshielded	-
5	USB Cable	1.2	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 30 MHz]
The EUT was placed on the platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.
The loop antenna was fixed height at 1.0 m.
The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., 135 deg., and 180 deg.) and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

[For above 30 MHz, up to 1 GHz]
The EUT was placed on the platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

[For above 1 GHz, up to 40 GHz]
The EUT was placed on the platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.
The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer.
The test was made with the detector (RBW/VBW) in the following table.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 1 GHz	1 GHz to 40 GHz
Instrument used	Test Receiver			Spectrum Analyzer
Detector	CISPR QP, Average	CISPR QP, Average	CISPR QP	Average *1)
IF Bandwidth	200 Hz	9 kHz	120 kHz	RBW: 1 MHz VBW: 3 MHz

*1) A RMS average mode was applied according to KDB653005 4 (b) and 5.4 (f).

[Test setup]

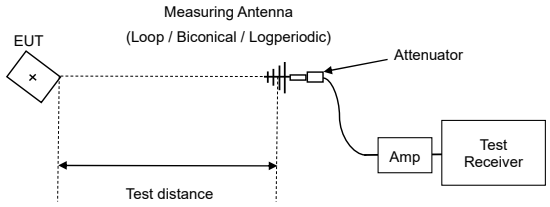
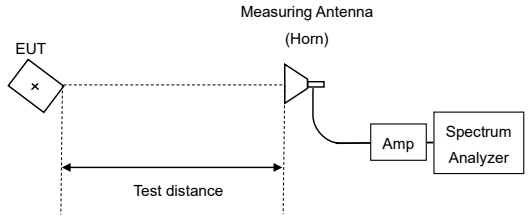
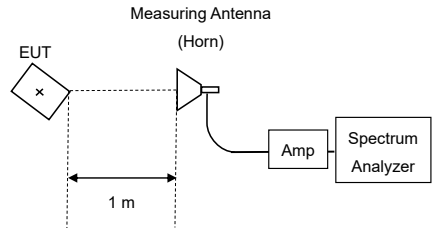
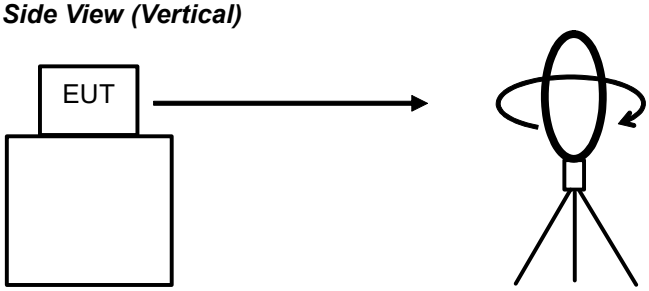
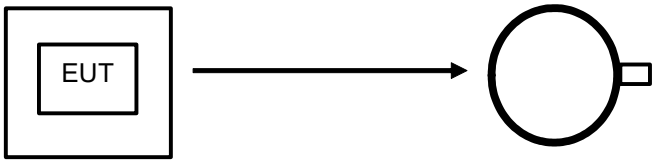
Below 1 GHz	
 × : Center of turn table	Test Distance: 3 m
1 GHz to 18 GHz	
 × : Center of turn table	Test Distance: 3 m
18 GHz to 40 GHz	
 × : Center of turn table	Distance Factor: 20 x log (1.0 m* / 3.0 m) = -9.5 dB *Test Distance: 1 m

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

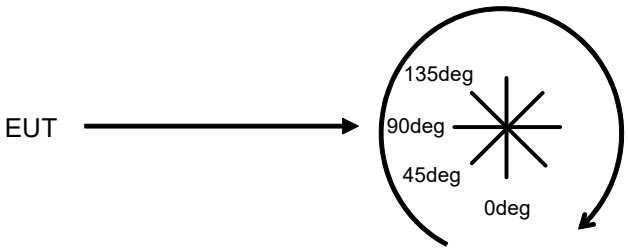


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

[Above 40 GHz (Except for fundamental measurement)]

The test was performed based on ANSI C63.26-2015 and KDB 653005.
The EUT was placed on the platform, raised 1.5 m above the conducting ground plane.
The measurements were performed on handheld method.

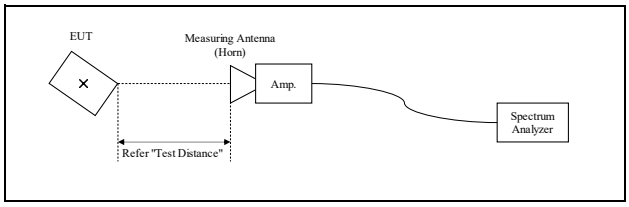
Set spectrum analyzer RBW, VBW, span, etc., to the proper values. Note these values. Enable two traces—one set to “clear write,” and the other set to “max hold.” Begin hand-held measurements with the test antenna (horn) at a distance of 1 m from the EUT in a horizontally polarized position. Slowly adjust its position, entirely covering the plane 1 m from the EUT. Observation of the two active traces on the spectrum analyzer will allow refined horn positioning at the point(s) of maximum field intensity. Repeat with the horn in a vertically polarized position. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

Note the maximum level indicated on the spectrum analyzer. Adjust this level, if necessary, by the antenna gain, filter loss, conversion loss of the external mixer and gain of LNA used, at the frequency under investigation. Calculate the field strength of the emission at the measurement distance from the Friis’ transmission equation.

The final test was performed with a 1 MHz RMS detector at the following distances;

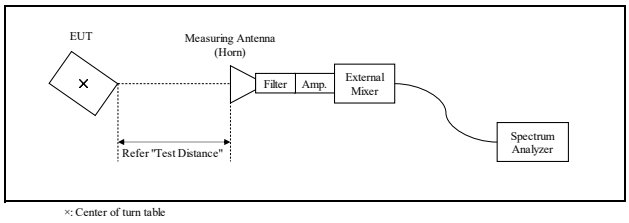
[Test setup]

40 GHz to 50 GHz



*Test Distance: 1.0 m

Above 50 GHz



*Test Distance:

50 GHz to 75 GHz	0.75 m
75 GHz to 76 GHz	1.0 m
81 GHz to 83 GHz	1.0 m
83 GHz to 110 GHz	0.5 m
110 GHz to 231 GHz	0.01 m
231 GHz to 243 GHz	0.01 m

The test results and limit are rounded off to one decimal place, so some differences might be observed.

The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

[About fundamental measurement]

The test was performed based on ANSI C63.26-2015 and KDB 653005.
The EUT was placed on a platform, raised 1.5 m above the conducting ground plane.
The measurements were performed on handheld method.

The carrier levels were confirmed at maximum direction of transmission. The maximum direction was searched under carefully since beam-widths are extremely narrow.

The carrier levels were measured in the far field. The distance of the far field was calculated from follow equation.

$$r = \frac{2D^2}{\lambda}$$

where

r is the distance from the radiating element of the EUT to the edge of the far field, in m
D is the largest dimension of both the radiating element and the test antenna (horn), in m
(The antenna aperture size of test antenna was used for this calculation.)
Lambda is the wavelength of the emission under investigation [300/f (MHz)], in m

Frequency	Wavelength	Maximum Dimension			Far Field Boundary	Tested Distance
		EUT	Test Antenna	Maximum		
	Lambda			*D*	*r*	
[GHz]	[mm]	[m]	[m]	[m]	[m]	[m]
78	3.8	0.003750	0.026162	0.026162	0.356	1.0

In order to maximize the carrier level, the EUT, which has a horizontally polarized antenna, and the polarization plane of the measurement antenna were aligned for the test.

The Peak Power results was applied to the desensitization correction factor by KDB653005 4 (c) and 5.4 (d).
The derivation of the FMCW Desensitization Factor is given in Keysight Application Note 5952 1039 Appendix B.

Desensitization factor was calculated from follow equation;

$$\alpha = \frac{1}{\sqrt[4]{1 + \left(\frac{2ln(2)}{\pi}\right)^2 \left(\frac{Fs}{Ts\ B^2}\right)^2}}$$

and

FMCW Desensitization factor = 20 Log (α)

Where

*F*s is FMCW Sweep Width or Chirp Width, is used the actual measurement value.
*T*s is FMCW Sweep Time, is used the actual measurement value.
B is -3dB Bandwidth of Gaussian RBW Filter, is used the actual measurement value.

Tx	F_s [MHz]	T_s [us]	B [MHz]	α	FMCW Desensitization factor [dB]
1	1734.9	39.2	1.0	0.226	-12.91
2	1730.1	39.3	1.0	0.227	-12.89
3	1741.1	39.3	1.0	0.226	-12.92

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9 kHz to 243 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Frequency Stability

Test Procedure
The block downconverter was placed in side of the temperature chamber's drain hole.

The power supply was set to nominal operating voltage (110 %), and the 99 % OBW was measured at 20 deg. C. After that, EUT power supply was varied between 85 % and 115 % of nominal voltage and the 99 % OBW was recorded.

The EUT operating temperature was raised to 50 deg. C, and the frequency excursion of the EUT emission mask was recorded. Measurements were repeated at each 10 deg. C decrement down to -20 deg. C.

Both lower and upper frequencies of the 99 % OBW were recorded.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

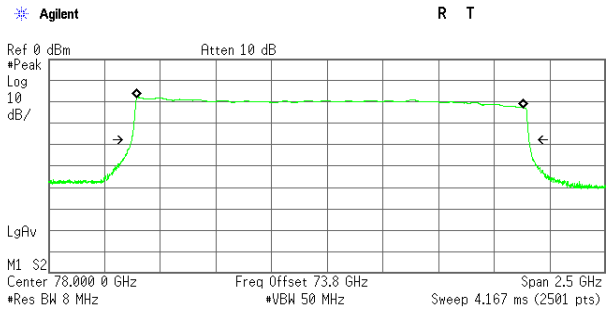
Occupied bandwidth

Mode	Test mode

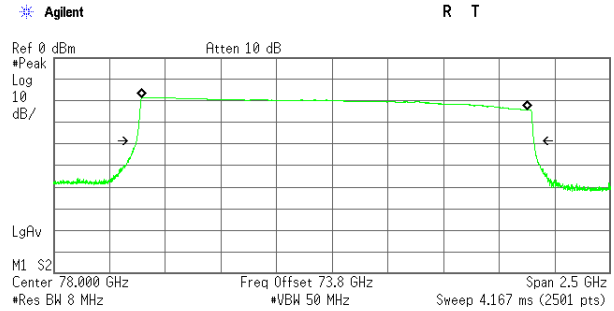
Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

Tx	99 % Occupied bandwidth [GHz]
1	1.7349
2	1.7301
3	1.7411

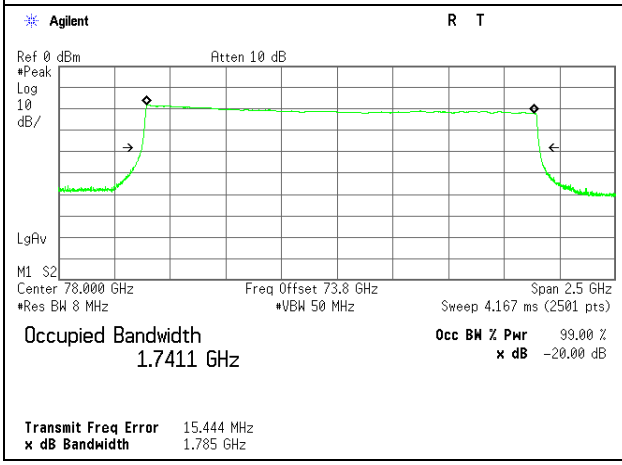
Tx1



Tx2



Tx3



The measurement was performed with Peak detector and Max Hold since the duty cycle was not 100 %.

Radiated Power

Mode	Test mode

Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

Tx	Power	Freq.	Measured Power	Rx Ant. Gain	Down Converter Gain	IF Cable Loss	Tested Distance	FSL	Duty Factor	FMCW desensitization Factor	EIRP		Limit	Margin
		[GHz]	[dBm]	[dBi]	[dB]	[dB]	[m]	[dB]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[dB]
1	Average	78.00	-35.01	23.14	13.48	2.43	1.0	70.28	15.04	-	16.12	40.93	50	33.88
	Peak	77.15	-30.77	23.07	14.80	2.16	1.0	70.19	-	-12.91	16.62	45.92	55	38.38
2	Average	78.00	-35.26	23.14	13.48	2.43	1.0	70.28	15.02	-	15.85	38.46	50	34.15
	Peak	77.15	-31.30	23.07	14.80	2.16	1.0	70.19	-	-12.89	16.07	40.46	55	38.93
3	Average	78.00	-35.76	23.14	13.48	2.43	1.0	70.28	15.02	-	15.35	34.28	50	34.65
	Peak	77.15	-30.94	23.07	14.80	2.16	1.0	70.19	-	-12.92	16.46	44.26	55	38.54

Calculating formula:
FSL (Free Space path Loss) = 10 * log10((4 * Pi * Tested Distance / Lambda) ^2)
Average EIRP = Measured Power - Rx Ant. Gain - Down Converter Gain + IF Cable Loss + FSL + Duty Factor
Peak EIRP = Measured Power - Rx Ant. Gain - Down Converter Gain + IF Cable Loss + FSL - FMCW desensitization factor

The test method referred to KDB653005 4 and 5.4.
The derivation of the Duty Factor is given in Duty data page.
The derivation of the FMCW Desensitization Factor is given in Keysight Application Note 5952 1039 Appendix B. (Refer Section 5)

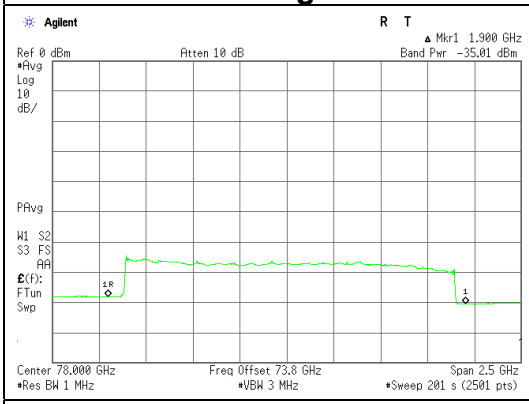
Radiated Power

Mode	Test mode

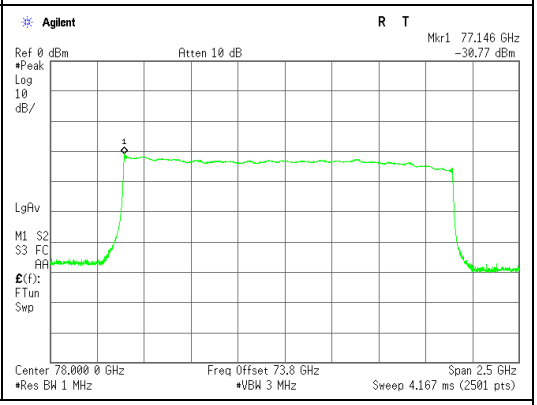
Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

Tx1

Average

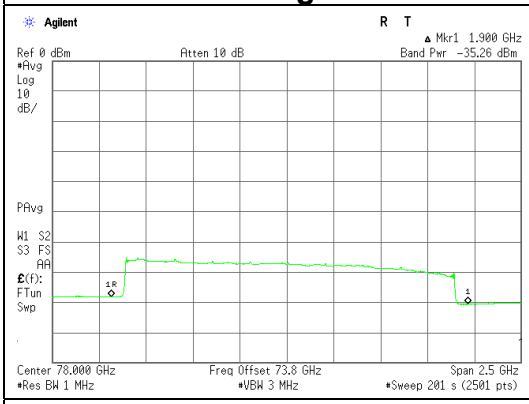


Peak

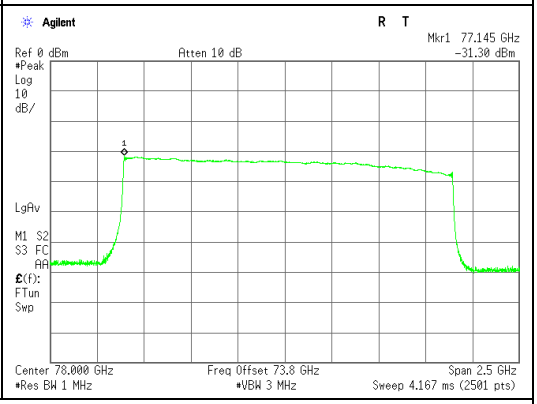


Tx2

Average

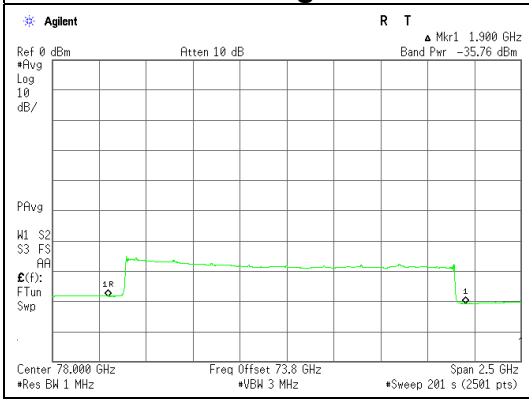


Peak

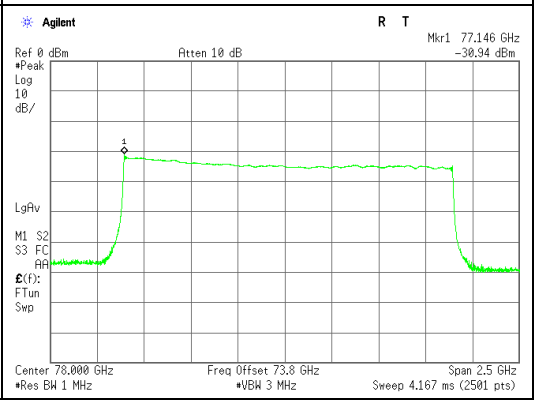


Tx3

Average



Peak



Modulation characteristics

Mode	Test mode

Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

	1 chirp (on time) [us]	1 burst [ms]	1 chirp (on + off time) [us]	Number of chirps Times	Tx on time [ms]	Tx (on + off time) [ms]	Duty [%]	Duty Factor [dB]
Tx1	39.193	3.064	48.012	64	2.51	80.000	3.1	15.04
Tx2	39.334	3.064	48.159	64	2.52	80.000	3.1	15.02
Tx3	39.317	3.064	48.011	64	2.52	80.000	3.1	15.02

Calculating formula:

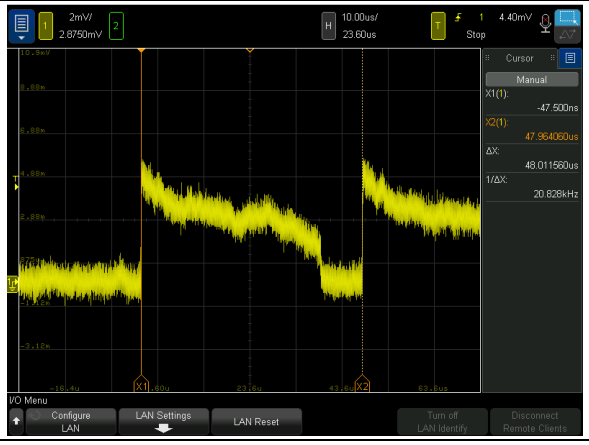
Number of chirps times = 1 burst / 1 chirp (on + off time) * 1000
Tx on time = 1 chirp (on time) * Number of chirp Times
Duty = (Tx on time / Tx (on + off time)) * 100
Duty factor = 10 * log (Tx (on + off time) / Tx on time)

[Data]

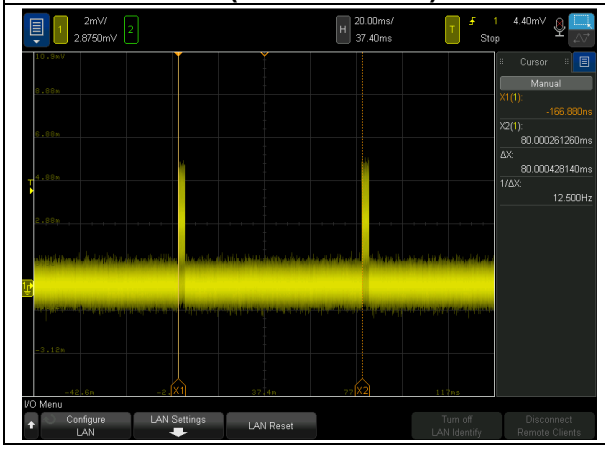
Tx1

1 chirp (on time)

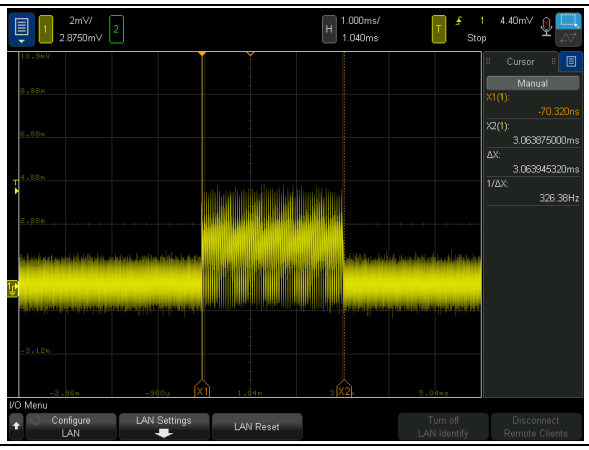
1 chirp (on + off time)



Tx (on + off time)



1 burst



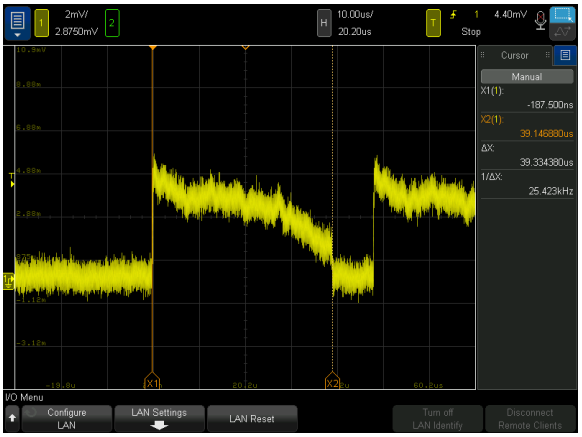
Modulation characteristics

Mode	Test mode

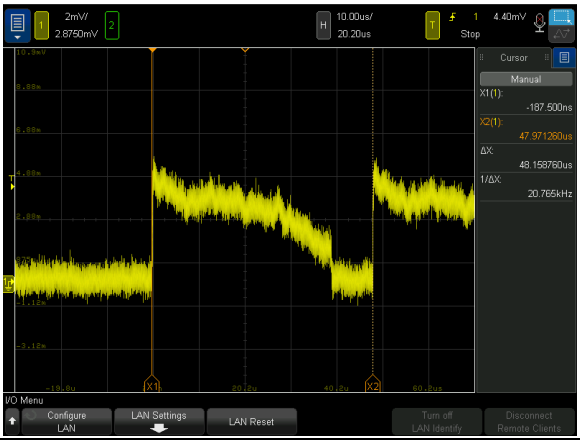
Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

Tx2

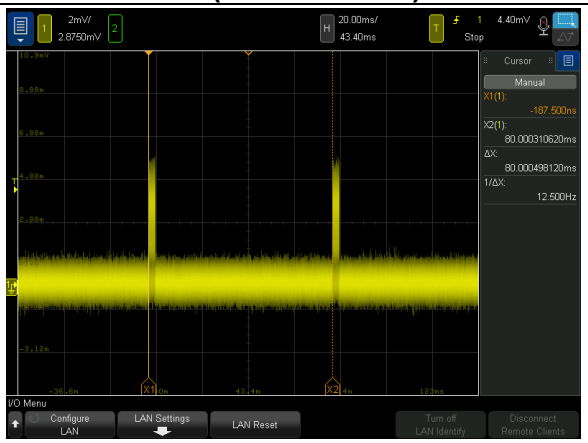
1 chirp (on time)



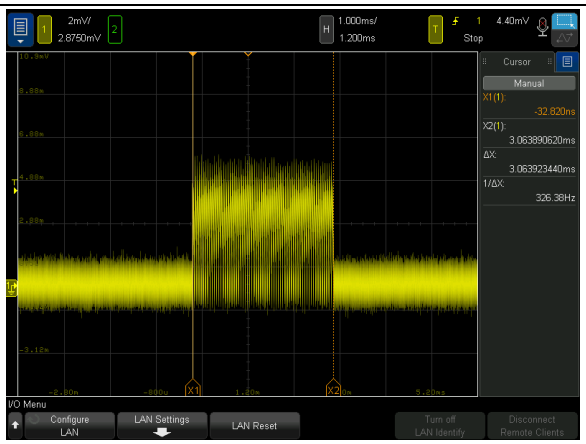
1 chirp (on + off time)



Tx (on + off time)



1 burst



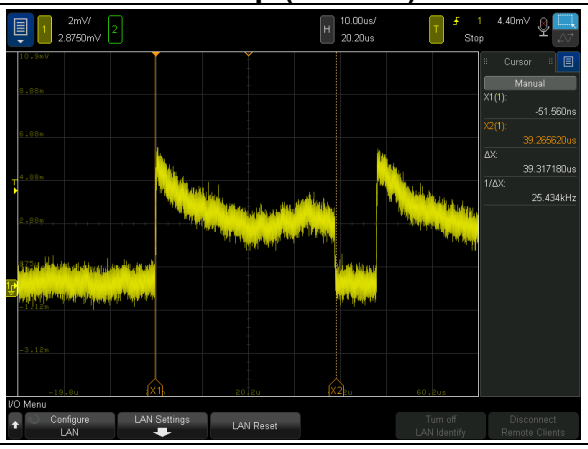
Modulation characteristics

Mode	Test mode

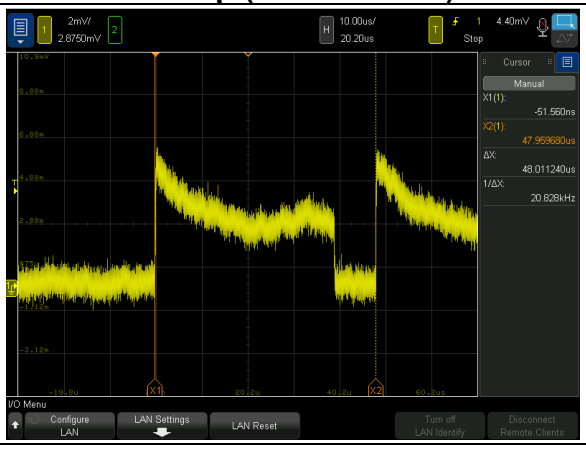
Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

Tx3

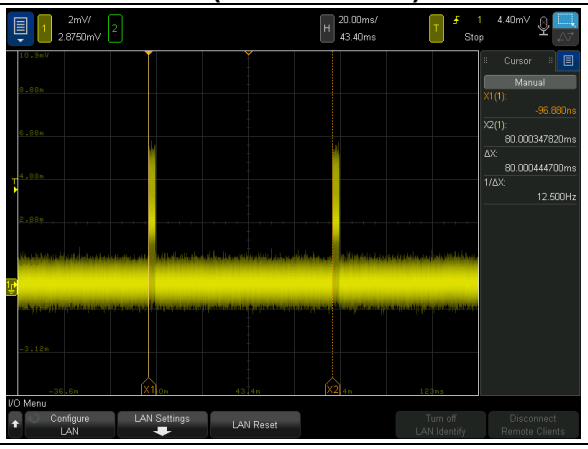
1 chirp (on time)



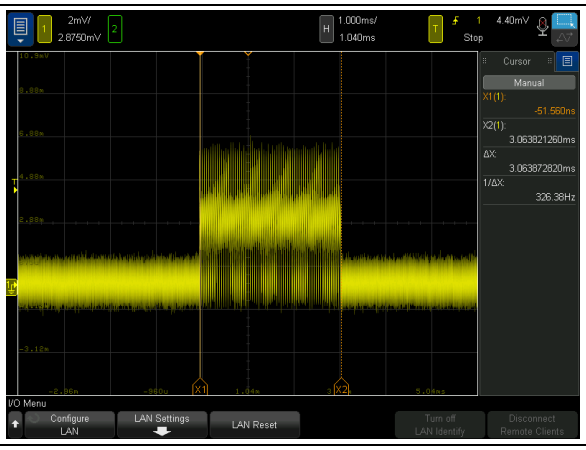
1 chirp (on + off time)



Tx (on + off time)



1 burst



Modulation characteristics (Reference data)

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi

	1 chirp (on time) [us]	1 burst [ms]	1 chirp (on + off time) [us]	Number of chirps Times	Tx (on + off time) [ms]
Declared *	-	14.4	150	96	80.000
Measured	39.218	14.290	150.014	96	80.000

Calculating formula:

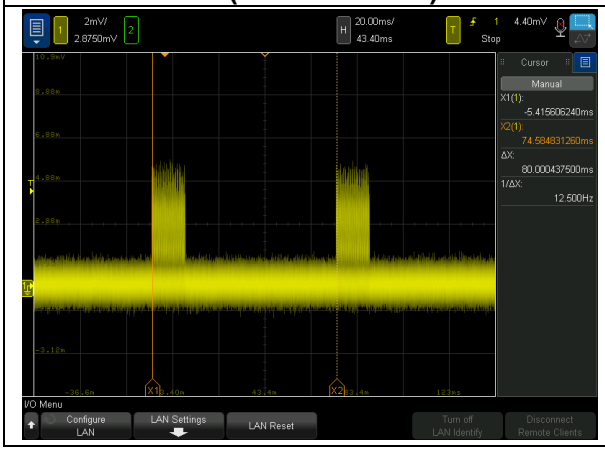
Number of chirps times = 1 burst / 1 chirp (on + off time) * 1000

*See the application document.

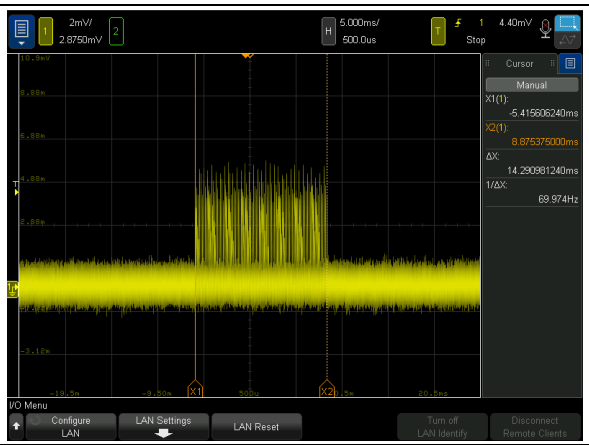
1 chirp (on time)

1 chirp (on + off time)

Tx (on + off time)



1 burst



Field strength of spurious radiation
(Below 40 GHz)

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
August 1, 2025	SAC3	22 deg. C	52 % RH	Junki Nagatomi	10 GHz to 40 GHz
August 3, 2025	SAC3	23 deg. C	53 % RH	Junki Nagatomi	Below 10 GHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	45.3	24.2	-	13.1	7.2	32.2	12.3	-	40.0	-	27.7	-	
Hori.	110.1	22.3	-	11.8	8.0	32.1	10.0	-	43.5	-	33.5	-	
Hori.	257.1	28.2	-	12.1	9.4	32.0	17.6	-	46.0	-	28.4	-	
Hori.	288.1	27.8	-	13.6	9.6	32.0	19.0	-	46.0	-	27.0	-	
Hori.	349.1	27.0	-	15.1	10.0	32.0	20.1	-	46.0	-	25.9	-	
Hori.	409.6	25.5	-	15.9	10.5	32.0	19.9	-	46.0	-	26.2	-	
Hori.	28799.9	-	52.9	43.9	-3.2	42.9	-	50.7	-	53.9	-	3.2	
Hori.	38549.7	-	50.2	44.0	-2.1	45.0	-	47.1	-	53.9	-	6.8	
Vert.	45.2	26.5	-	13.1	7.2	32.2	14.7	-	40.0	-	25.4	-	
Vert.	79.0	27.3	-	6.9	7.7	32.2	9.7	-	40.0	-	30.3	-	
Vert.	116.4	25.3	-	12.6	8.1	32.1	13.8	-	43.5	-	29.7	-	
Vert.	174.9	28.5	-	16.0	8.7	32.1	21.1	-	43.5	-	22.4	-	
Vert.	261.0	26.0	-	12.3	9.4	32.0	15.7	-	46.0	-	30.4	-	
Vert.	371.1	22.6	-	15.1	10.2	32.0	15.9	-	46.0	-	30.2	-	
Vert.	28799.9	-	49.5	43.9	-3.2	42.9	-	47.3	-	53.9	-	6.6	
Vert.	38549.7	-	49.6	44.0	-2.1	45.0	-	46.5	-	53.9	-	7.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

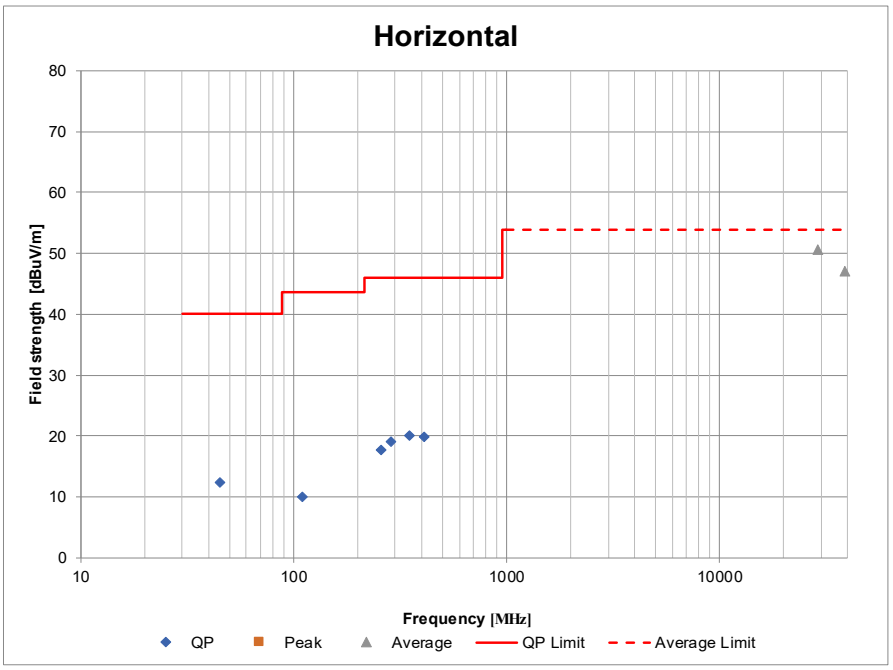
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

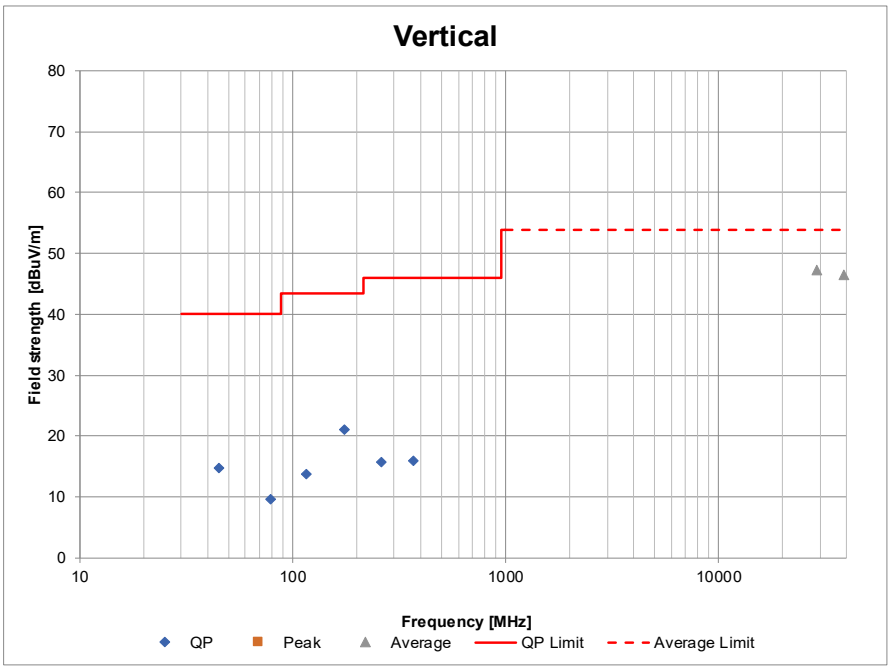
Distance factor: 18 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Field strength of spurious radiation
(Below 40 GHz)
(Plot data, Worst case)

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
August 1, 2025	SAC3	22 deg. C	52 % RH	Junki Nagatomi	10 GHz to 40 GHz
August 3, 2025	SAC3	23 deg. C	53 % RH	Junki Nagatomi	Below 10 GHz





*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Field strength of spurious radiation
(Above 40 GHz)

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi	75 GHz to 76 GHz
August 1, 2025	SAC3	22 deg. C	52 % RH	Junki Nagatomi	40 GHz to 50 GHz
August 4, 2025	SAC2	24 deg. C	48 % RH	Junki Nagatomi	50 GHz to 75 GHz
August 5, 2025	SAC2	22 deg. C	56 % RH	Junki Nagatomi	76 GHz to 231 GHz
September 5, 2025	SAC1	20 deg. C	50 % RH	Junki Nagatomi	231 GHz to 243 GHz

Frequency	Reading	Rx Ant. gain	Filter loss	LNA gain	Mixer conversion loss	IF Amp. gain	IF Cable loss	Meas. range *D*	FSL	EIRP		Power density at 3 m			Remarks
												Result	Limit	Margin	
[GHz]	[dBm]	[dBi]	[dB]	[dB]	[dB]	[dB]	[dB]	[m]	[dB]	[dBm]	[mW]	[pW/cm^2]	[pW/cm^2]	[dB]	
48.696	-58.13	22.18	0.00	33.44	0.00	0.00	8.68	1.0	66.19	-38.88	0.00013	0.11	600	37.19	NS
56.549	-75.84	23.46	0.30	26.16	45.39	32.07	0.08	0.75	64.99	-46.77	0.00002	0.02	600	45.09	NS
60.690	-75.77	23.76	0.26	24.86	45.88	32.07	0.08	0.75	65.61	-44.63	0.00003	0.03	600	42.95	NS
64.442	-75.97	24.00	0.38	23.66	47.31	32.07	0.08	0.75	66.13	-41.81	0.00007	0.06	600	40.12	NS
71.990	-76.12	24.33	0.74	20.45	48.65	32.07	0.08	0.75	67.09	-36.41	0.00023	0.20	600	34.72	NS
73.636	-76.94	24.46	0.83	20.64	49.63	32.07	0.08	0.75	67.28	-36.28	0.00024	0.21	600	34.60	NS
75.168	-72.74	23.02	0.00	0.00	-15.08	0.00	1.47	1.0	69.96	-39.41	0.00011	0.10	600	37.72	NS
82.070	-63.28	23.50	1.80	34.03	40.94	32.07	0.08	1.0	70.73	-39.34	0.00012	0.10	600	37.65	NS
83.848	-62.70	23.57	0.09	32.31	41.73	32.07	0.08	0.5	64.89	-43.86	0.00004	0.04	600	42.17	NS
94.742	-62.81	24.25	0.27	33.07	42.41	32.07	0.08	0.5	65.95	-43.48	0.00004	0.04	600	41.80	NS
95.966	-62.09	24.21	0.38	34.02	42.57	32.07	0.08	0.5	66.06	-43.30	0.00005	0.04	600	41.61	NS
100.620	-61.48	24.53	0.38	32.56	43.45	32.07	0.08	0.5	66.47	-40.25	0.00009	0.08	600	38.57	NS
102.146	-63.25	24.51	0.21	31.31	43.19	32.07	0.08	0.5	66.61	-41.05	0.00008	0.07	600	39.37	NS
111.641	-90.92	22.35	0.00	16.68	59.33	0.00	0.00	0.01	33.40	-37.22	0.00019	0.17	600	35.54	NS
119.806	-91.06	22.64	0.00	18.94	50.87	0.00	0.00	0.01	34.01	-47.76	0.00002	0.01	600	46.08	NS
131.988	-92.21	23.00	0.00	18.84	51.12	0.00	0.00	0.01	34.85	-48.08	0.00002	0.01	600	46.39	NS
141.777	-92.45	23.22	0.00	18.61	53.04	0.00	0.00	0.01	35.47	-45.76	0.00003	0.02	600	44.08	NS
143.382	-92.35	23.24	0.00	18.60	53.63	0.00	0.00	0.01	35.57	-44.99	0.00003	0.03	600	43.31	NS
150.402	-93.37	23.33	0.00	17.30	56.60	0.00	0.00	0.01	35.99	-41.41	0.00007	0.06	600	39.73	NS
154.739	-93.49	23.37	0.00	16.87	56.13	0.00	0.00	0.01	36.23	-41.37	0.00007	0.06	600	39.69	NS
163.092	-94.00	23.40	0.00	15.27	59.75	0.00	0.00	0.01	36.69	-36.23	0.00024	0.21	600	34.55	NS
172.098	-91.18	22.44	0.00	0.00	59.62	0.00	0.00	0.01	37.16	-16.84	0.02071	18.31	600	15.15	NS
183.022	-91.70	22.70	0.00	0.00	56.34	0.00	0.00	0.01	37.69	-20.37	0.00919	8.13	600	18.68	NS
192.919	-91.79	22.90	0.00	0.00	57.11	0.00	0.00	0.01	38.15	-19.43	0.01141	10.09	600	17.74	NS
195.085	-91.64	22.94	0.00	0.00	57.66	0.00	0.00	0.01	38.25	-18.67	0.01358	12.01	600	16.99	NS
203.565	-92.51	23.07	0.00	0.00	57.91	0.00	0.00	0.01	38.62	-19.05	0.01244	11.00	1000	19.59	NS
209.616	-92.37	23.16	0.00	0.00	59.97	0.00	0.00	0.01	38.87	-16.69	0.02141	18.93	1000	17.23	NS
216.094	-93.34	23.23	0.00	0.00	61.01	0.00	0.00	0.01	39.13	-16.42	0.02280	20.16	1000	16.96	NS
226.199	-93.11	23.32	0.00	0.00	62.38	0.00	0.00	0.01	39.53	-14.52	0.03531	31.22	1000	15.06	NS
234.531	-93.46	23.37	0.00	0.00	66.61	0.00	0.00	0.01	39.85	-10.38	0.09170	81.08	1000	10.91	NS
239.470	-94.50	23.39	0.00	0.00	71.57	0.00	0.00	0.01	40.03	-6.30	0.23463	207.46	1000	6.83	NS

Calculation:

FSL (Free Space path Loss) = 10 * log ((4 * Pi * D / λ)^2)

EIRP = Reading - Rx Ant. gain + Filter loss - LNA gain + Mixer conversion loss - IF Amp. gain + IF Cable loss + FSL

Power density Result at 3 m = EIRP / (4 * Pi * 300^2)

These calculation results are same as results which were calculated with formulas described in the Section 9 of ANSI C63.10-2020 / ANSI/USEMCSC C63.10/Cor 1-2023.

The equipment were not used for factor 0 dB of the data sheets.

The Mixer conversion loss and IF Cable Loss are automatically corrected in the mixer, so the factor of data sheet were 0 dB.

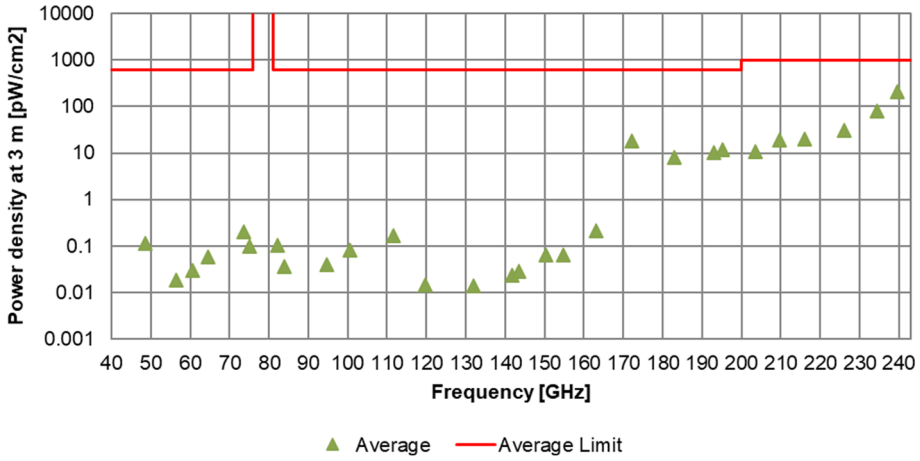
The IF Cable loss is included in Mixer loss, so the factor of data sheet were 0 dB.

NS: No signal detected.

Field strength of spurious radiation
(Above 40 GHz)
(Plot data, Worst case)

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
July 31, 2025	SAC3	22 deg. C	46 % RH	Junki Nagatomi	75 GHz to 76 GHz
August 1, 2025	SAC3	22 deg. C	52 % RH	Junki Nagatomi	40 GHz to 50 GHz
August 4, 2025	SAC2	24 deg. C	48 % RH	Junki Nagatomi	50 GHz to 75 GHz
August 5, 2025	SAC2	22 deg. C	56 % RH	Junki Nagatomi	76 GHz to 231 GHz
September 5, 2025	SAC1	20 deg. C	50 % RH	Junki Nagatomi	231 GHz to 243 GHz



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Frequency Stability

Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer
August 7, 2025	MR6	22 deg. C	55 % RH	Yuichiro Yamazaki

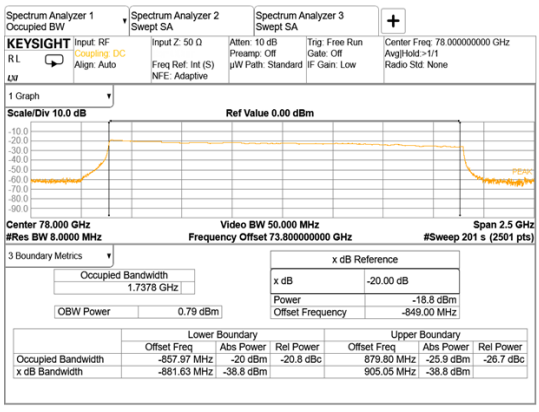
Test Condition		Center	Occupied Bandwidth		Occupied Bandwidth		Remarks
Temperature	Power Supply	Frequency	Lower Boundary Offset Freq.	Upper Boundary Offset Freq.	The Lower Frequency	The Upper Frequency	
[deg. C]	[V]	[GHz]	[MHz]	[MHz]	[GHz]	[GHz]	
50	14.08	78	-857.97	879.80	77.14203	78.87980	
40	14.08	78	-857.93	878.48	77.14207	78.87848	
30	14.08	78	-856.46	876.65	77.14354	78.87665	
20	14.08	78	-856.31	875.44	77.14369	78.87544	
20	10.88	78	-856.33	876.01	77.14367	78.87601	85 % of the operating voltage, DC 12.8 V * 0.85
20	14.72	78	-856.27	876.42	77.14373	78.87642	115 % of the operating voltage, DC 12.8 V * 1.15
10	14.08	78	-855.20	877.28	77.14480	78.87728	
0	14.08	78	-854.97	883.36	77.14503	78.88336	
-10	14.08	78	-854.29	885.27	77.14571	78.88527	
-20	14.08	78	-854.08	888.63	77.14592	78.88863	

Calculation:
The Lower Frequency = Center Frequency + Lower Boundary Offset Freq.
The Upper Frequency = Center Frequency + Upper Boundary Offset Freq.

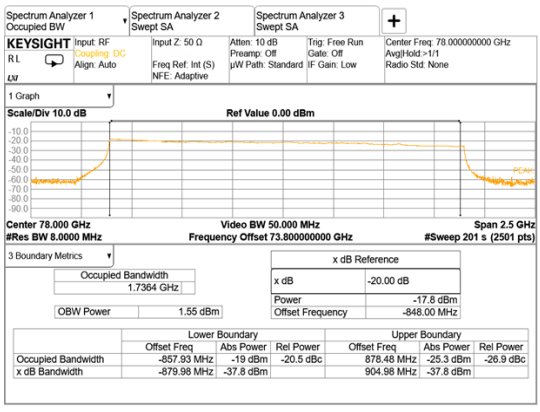
Fundamental emissions were contained within the frequency band 76 GHz to 81 GHz during all conditions of operation.

[Data]

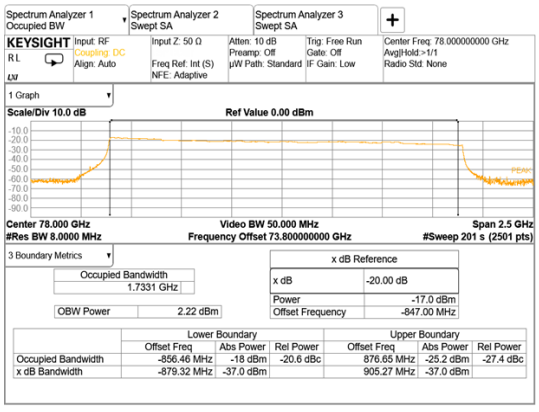
50 deg. C, DC 14.08 V



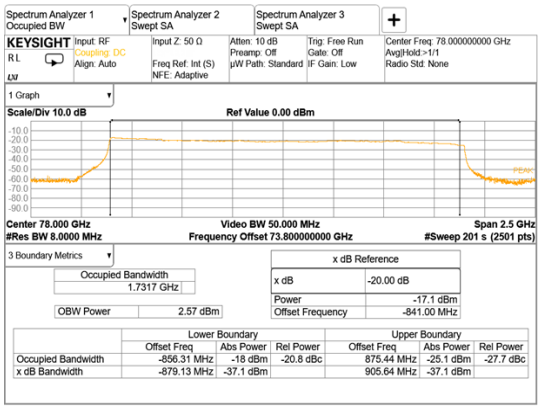
40 deg. C, DC 14.08 V



30 deg. C, DC 14.08 V



20 deg. C, DC 14.08 V

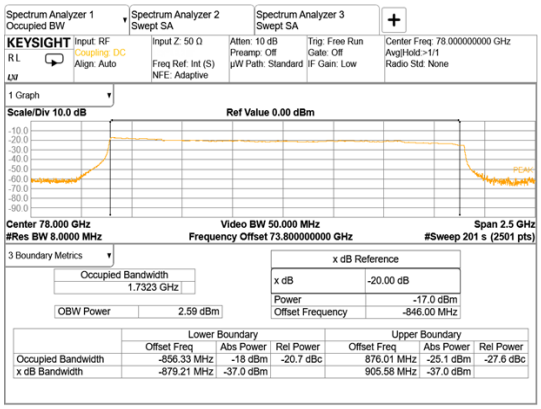


Frequency Stability

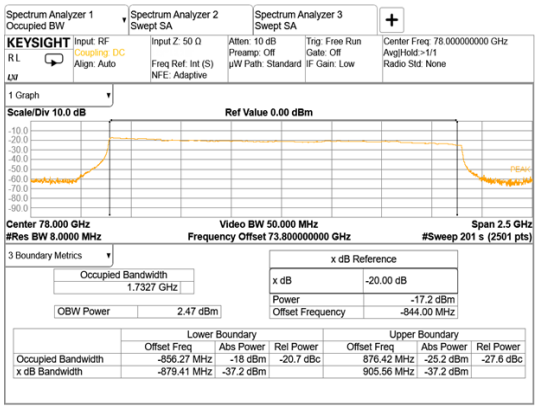
Mode	Normal operating mode

Date	Test site	Temperature	Humidity	Engineer
August 7, 2025	MR6	22 deg. C	55 % RH	Yuichiro Yamazaki

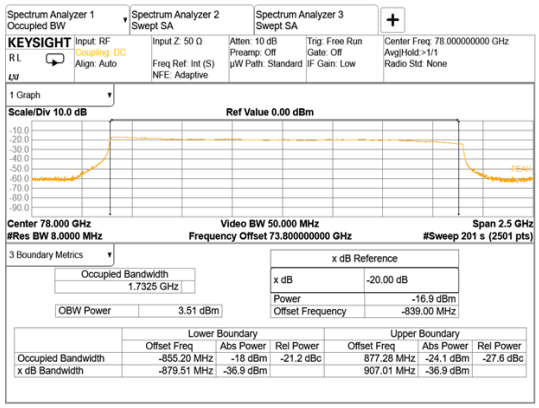
20 deg. C, DC 10.88 V



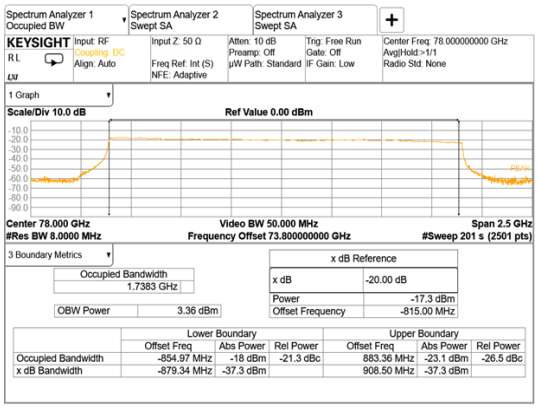
20 deg. C, DC 14.72 V



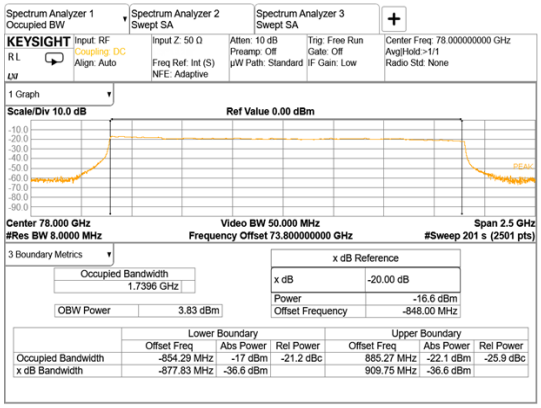
10 deg. C, DC 14.08 V



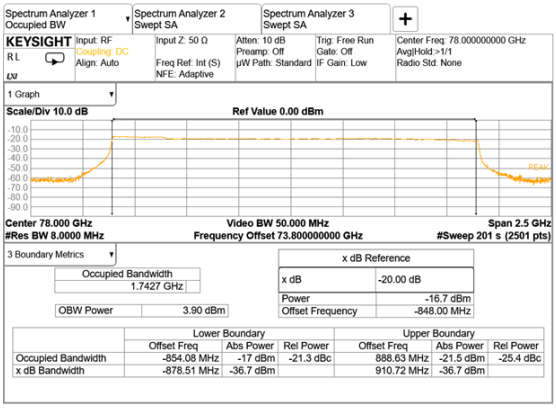
0 deg. C, DC 14.08 V



-10 deg. C, DC 14.08 V



-20 deg. C, DC 14.08 V



APPENDIX 2: Test instruments

Test equipment (1/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ sucoform141-PE/ 421-010/RFM-E321(SW)	-/00640	07/04/2025	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/14/2025	12
RE	141279	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	03/03/2025	12
RE	141323	Coaxial cable	UL-ISE	-	-	09/13/2024	12
RE	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+BBA9106	08031	07/22/2025	12
RE	141429	Temperature and Humidity Chamber	Espec	PL-2KP	14015723	08/28/2025	12
RE	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	06/18/2025	12
RE	141504	Horn Antenna 26.5-40GHz	EMCO	3160-10	1150	09/09/2024	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/11/2024	12
RE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	02/25/2025	12
RE	141532	DIGITAL HiTESTER	HIOKI E. E. CORPORATION	3805	051201197	01/16/2025	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/01/2025	12
RE	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/13/2025	12
RE	141568	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	2901	01/19/2025	12
RE	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/24/2025	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/14/2025	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/02/2025	12
RE	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	05/15/2025	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	06/30/2025	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	11/28/2024	12
RE	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	07/07/2025	24
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	07/08/2025	24
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	07/09/2025	24
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/14/2025	24
RE	142026	Diplexer	OML INC.	DPL26	-	-	-
RE	142032	Microwave Cable	Huber+Suhner	SUCOFLEX102	37511/2	-	-
RE	142037	Horn Antenna	Custom Microwave Inc.	HO6R	-	09/03/2024	12
RE	142039	Horn Antenna	Custom Microwave Inc.	HO4R	-	09/03/2024	12
RE	142041	Horn Antenna	Oshima Prototype Engineering Co.	A16-187	1	09/03/2024	12
RE	142042	High Pass Filter 81-110GHz	AmTechs Corporation	HPF-10-778030	201	07/16/2025	12
RE	142047	Preselected Millimeter Mixer	Keysight Technologies Inc	11974V-E01	3001A00412	12/12/2024	12
RE	142048	Harmonic Mixer	Keysight Technologies Inc	11970W	2521 A01909	12/10/2024	12
RE	142049	Harmonic Mixer	OML INC.	M06HWD	D100709-1	12/16/2024	12
RE	142050	Block Downconverter	Keysight Technologies Inc	PS-X30-W10117A	13715	12/02/2024	12
RE	142053	Harmonic Mixer	OML INC.	M04HWD	Y100709-1	12/18/2024	12
RE	142055	Power Amplifier	SAGE Millimeter, Inc.	SBP-5037532015-1515-N1	11599-01	12/11/2024	12
RE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
RE	142225	Tape Measure	ASKUL	-	-	-	-
RE	142226	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/24/2025	12
RE	142526	Detector	Keysight Technologies Inc	8473C	00789B	-	-

Test equipment (2/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	151897	Microwave Cable	Huber+Suhner	SF101EA/11PC24/ 11PC24/2.5M	SN MY1726/ 1EA	04/22/2025	12
RE	159919	Power Amplifier	SAGE Millimeter, Inc.	SBP-4035033018-2F2F-S1	12559-01	12/12/2024	12
RE	176027	D-Band Low Noise Amplifier	SAGE Millimeter, Inc.	SBL-1141741860-0606-EI	15235-01	07/16/2025	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	180544	Horn Antenna	SAGE Millimeter, Inc.	SAZ-2410-10-S1	17343-01	06/24/2025	12
RE	180607	Power Amplifier	SAGE Millimeter, Inc.	SBP-7531142515-1010-E1	17343-01	09/06/2024	12
RE	180634	Horn Antenna	SAGE Millimeter, Inc.	SAZ-2410-15-S1	17343-01	06/24/2025	12
RE	199856	WR-10 HighPass Filter	Oshima Prototype Engineering Co.	A20-110-A01	001	03/06/2025	12
RE	207745	Coaxial Cable	UL-ISE	-	-	03/19/2025	12
RE	211944	Digital Storage Oscilloscope	Keysight Technologies Inc	DSOX6002A	MY59380318	12/20/2024	12
RE	237927	Broadband Amplifier	ERAVANT	SBB-0115033218-2F2F-E3	27554-01	07/02/2025	12
RE	243512	Amplifier	ERAVANT	SBL-2734034025-2F2F-E3	30353-01	07/02/2025	12
RE	244707	Thermo-Hygrometer	HIOKI E. E. CORPORATION	LR5001	231202102	01/19/2025	12
RE	244709	Thermo-Hygrometer	HIOKI E. E. CORPORATION	LR5001	231202103	01/19/2025	12
RE	244712	Thermo-Hygrometer	HIOKI E. E. CORPORATION	LR5001	231202106	01/19/2025	12
RE	245787	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	689	04/01/2025	12
RE	246778	Microwave Cable	Huber+Suhner	SF126E/11PC35/ 11PC35/2000MM	SN 537000/ 126E	-	-
RE	252514	Active Loop Antenna	Schwarzbeck Mess-Elektronik OHG	FMZB 1519-60 D	1519-60 D-067	09/26/2024	12
RE	254838	Microwave Cable	Huber+Suhner	SUCOFLEX102	2001316 /2	12/03/2024	12
RE	263275	Microwave Cable	Junkosha	MWX221-05000DMSDMS+ MWX221-01000DMSDMS	2505S043+ 2503S145	05/20/2025	12

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test Item: RE: Radiated Emission